Honors Chemistry - Thermochemistry Problem Set

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1. How do you know whether energy has been released or absorbed?

2. If a sample of chloroform is initially at 25°C, and its final temperature 236°C. If it absorbs 1.0 kilojoules of heat, and the specific heat of chloroform is 0.96 J/g°C, what is the mass of the sample in grams?

3. Pure liquid acetic acid is made from the reaction between methanol and carbon monoxide, as seen below. If you produce 1.00 L of acetic acid (which has a mass of 1004 grams), how much energy is evolved? $CH_3OH(l) + CO(g) \rightarrow CH_3COOH(l)$ ΔH - -355.9 kJ

4. Carbon tetrachloride can be formed by reacting chlorine with methane: $CH_4 + 2Cl_2 \rightarrow CCl_4 + 2H_2$. Given that the heat of formation of methane is -75 kJ/mol and the heat of formation of carbon tetrachloride is -135 kJ/mol, determine the heat of reaction.

5. A reaction has a ΔS of -122 J/(K·mol) and a ΔH of -78 kJ/mol. Is this reaction spontaneous at 285°C? First determine ΔG to know if it is spontaneous or not.

6. What temperature change can be expected when 250.0 g of water absorbs 5050 J of heat? The specific heat of $H_2O = 4.18 J/(g \cdot °C)$.